

CASE REPORT

Endodontic management of a rare case of the geminated maxillary second molar tooth using CBCT

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Abstract

This report illustrates a rare case of a geminated maxillary right second molar tooth using CBCT in a 23-year-old man with severe pain. Nonsurgical endodontic treatment was performed, which gave rise to an asymptomatic tooth at the 12-month follow-up.

KEYWORDS

CBCT, fusion, gemination, maxillary second molar

1 | INTRODUCTION

A case of gemination of a maxillary second molar tooth is reported. A 23-year-old man with severe pain was referred. CBCT images showed an extra cusp on the buccal aspect of the tooth with a distinct canal space. Nonsurgical endodontic treatment was undertaken. At the 12-month follow-up, the tooth was asymptomatic.

Endodontic treatment of teeth with developmental anomalies poses a challenge to clinicians and endodontists.¹ Endodontists face anatomical anomalies in the number, size, and shape frequently. These anomalies lead to endodontic treatment failure directly or indirectly.² Microdontia, macrodontia, dens invaginatus, talon cusp, dens evaginatus, gemination, fusion, root dilaceration, taurodontism, and concrescence comprise tooth shape anomalies.³

Gemination (double teeth) (Figure 1A) is defined as the formation of a tooth twice the width of a tooth from the same dental follicle. It results from a failed attempt of a tooth to divide and form two teeth, clinically evidenced by a groove or

depression, delineating two teeth. This failed attempt might lead to what would resemble two teeth equal in size, with possibly normal dimensions, or with one tooth possibly exhibiting a rudimentary form.

If the bifid tooth is counted as one entity in gemination, the total number of teeth in the dental arch is otherwise normal. In the majority of cases, it is seen in anterior teeth, and it is rarely seen in posterior teeth.⁴

Fusion (Figure 1B) is defined as the union of two neighboring tooth buds during their developmental stage due to physical force or pressure. When these follicles unite, the developmental stage determines whether there should be one tooth with one pulp chamber with confluent enamel and dentin or two separate pulp chambers with the union of dentin only. Fusion is distinguished from gemination by the congenital absence of an adjacent tooth.⁵ Concrecence is defined as the union of two adjacent teeth only via their cementum, with interdental bone breakdown.⁶

The management of a geminated tooth entails a clear understanding of root canal morphology. In the present case

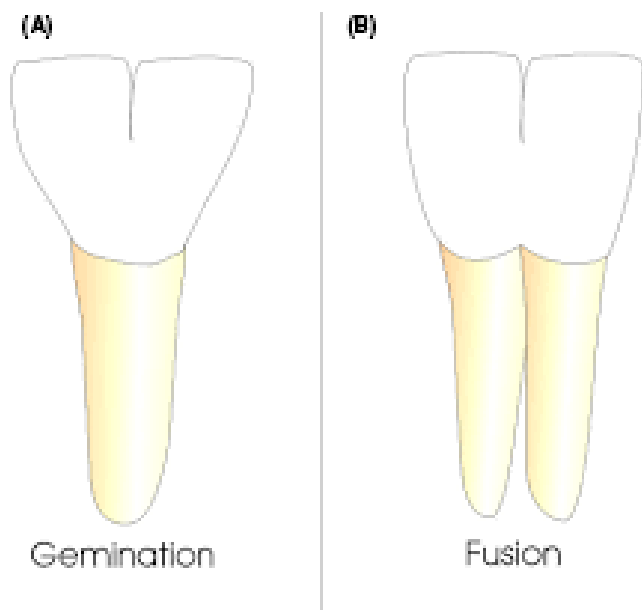


FIGURE 1 Examples of (A) gemination; (B) fusion



FIGURE 2 Intraoral photograph of the tooth

report, we describe a geminated maxillary second molar tooth that underwent a successful root canal treatment procedure, using cone-beam computed tomography (CBCT) to analyze the root canal morphology as part of the endodontic management.

2 | CASE PRESENTATION

This study was approved by the Ethics Committee of Qazvin University of Medical Sciences, under the code IR.QUMS.REC.1399.068.

A 23-year-old man with a chief complaint of severe pain in the maxillary right second molar tooth for 2 days previously was referred to the Dentistry School, Qazvin University of Medical Science, Qazvin, Iran. The patient's medical history provided no significant finding. There was no previous history of trauma or any hereditary conditions. Intraoral examination revealed a large crown with an abnormal extra cusp on the buccal aspect of the tooth (Figure 2). There were no decay, swelling, and sinus tracts. The number of teeth was normal. The crown shape was normal, too. There was no facial asymmetry or facial swelling, and palpation of the cervical and submandibular lymph nodes did not reveal any abnormality.

Pulp vitality tests revealed no response to cold (Roeko Endo-Frost; Roeko, Langenau, Germany), heat using heated gutta-percha, and an electronic pulp tester (Gentle Pulse; Parkell Inc., Edgewood, NY, USA) compared with the control teeth. The right maxillary second molar tooth exhibited tenderness to percussion. There was no sensitivity to palpation and abnormal pocket depth. Tooth mobility was within the normal physiologic range. A preoperative periapical radiograph revealed no caries, restoration, apical pathology, and PDL widening (Figure 3).

A diagnosis of pulp necrosis and symptomatic apical periodontitis of the right maxillary second molar tooth was reached. Because of the limitations of the 2D conventional radiography and to confirm the unusual morphology, a CBCT examination was undertaken using a CBCT Promax3D (Planmeca, Finland) with a voxel size of 0.15 mm, followed by 0.3 mm. CBCT images were obtained with 87 KVp, 10 mA, exposure time of 12 sec, and field of view (FOV) of 8 × 8 cm.

Examination of the sagittal CBCT images showed an extra cusp attached to the buccal surface of the main tooth, with a distinct canal space (Figure 4). The axial CBCT images revealed the extra root canal, and the mesiobuccal (MB) root



FIGURE 3 Preoperative radiograph of the right maxillary second molar

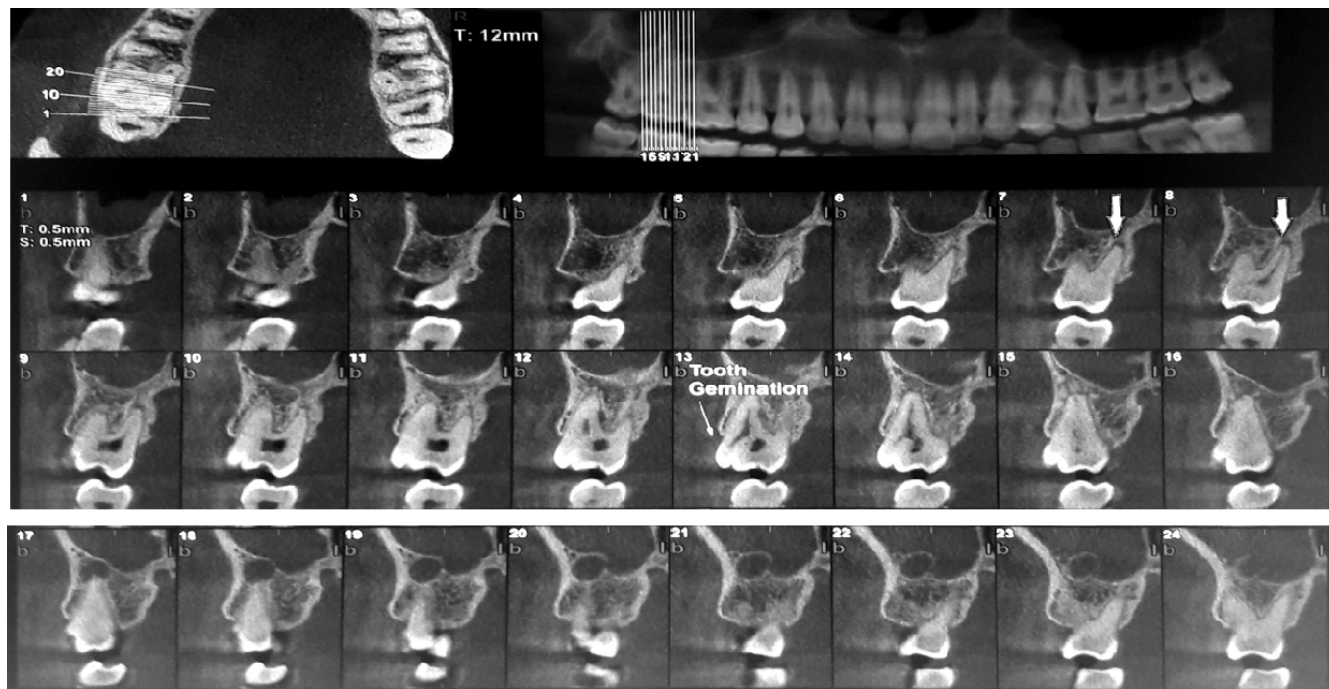


FIGURE 4 Sagittal view showing an extra cusp attached to the buccal surface of the tooth

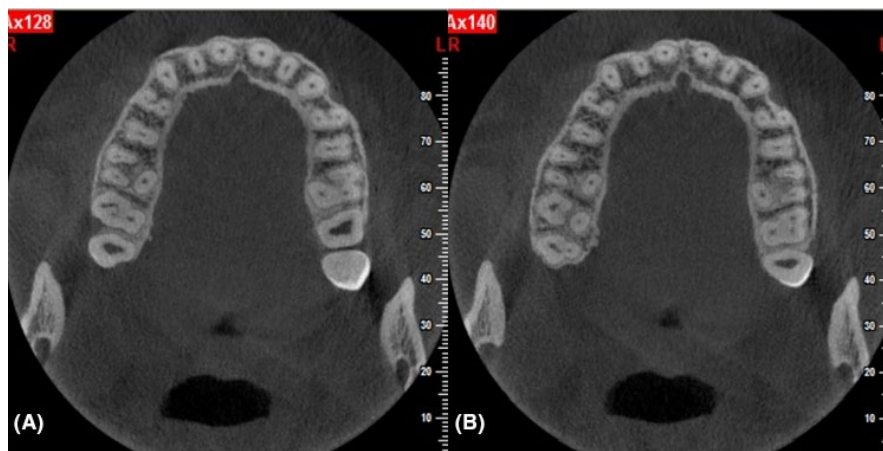
canal joined in the coronal third, and both reached the distobuccal (DB) canal in the middle third of the root (Figure 5).

There was also a groove between the main crown and the extra crown, and because they were attached only on the root region and were separated in the coronal region, we concluded that it was gemination.

The treatment plan consisted of root canal therapy, restoration, and follow-up. After the treatment procedure was explained to the patient during the first visit, an informed consent form was signed by him. After local anesthesia using the infiltration technique with 2% lidocaine with 1/80000 epinephrine and rubber dam isolation, two separate access cavities were prepared with a diamond fissure bur. The working length (WL) was determined by a Root ZX electronic apex locator and confirmed with an x-ray technique (Figure 6).

The root canals were instrumented with RaCe rotary files (FKG, Swiss endo); 5.25% NaOCl and normal saline solutions were used for irrigation. Apical preparation of the palatal root canal was accomplished up to file #40 with 4% taper and in the MB and DB root canals up to file #30 with 6% taper and the extra root canal up to file #25 with 6% taper, respectively. Coronal flaring was carried out with SX ProTaper rotary files (Dentsply, Sirona, Switzerland). Subsequently, the root canals were dried with paper points, and a creamy paste of $\text{Ca}(\text{OH})_2$ was carried into the root canal by a Lentulo spiral. The access cavity was sealed with Cavit (Golchai, Iran), and the subsequent follow-up visit was scheduled for 1 week later. The patient was advised to take a 400-mg ibuprofen tablet (Loghman, Iran) every 6 h for 2–3 days if the pain persisted.

FIGURE 5 Cone-beam computed tomography axial slices showing that MB canals are joined in the (A) coronal third; (B) both reach the DB canal in the middle third



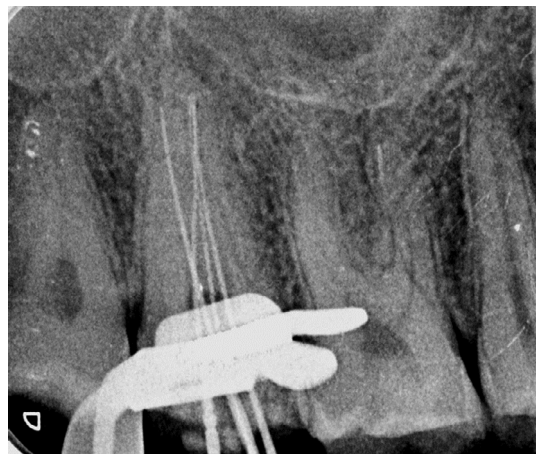


FIGURE 6 Radiograph to determine the working length



FIGURE 7 Post-obturation radiograph

During the second visit, tooth sensitivity to percussion had resolved. Local anesthesia was administered via infiltration (2% lidocaine with 1/80000 epinephrine). Then, the tooth was isolated with a rubber dam, and the temporary restorative material and $\text{Ca}(\text{OH})_2$ dressing were removed. The smear layer was eliminated with 10 ml of 17% EDTA for 1 min, followed by 10 ml of 5.25% NaOCl and a final flush with the normal saline solution. After selecting the master apical gutta-percha cone, the tooth underwent a radiographic

examination, followed by root canal obturation with gutta-percha (Gapadent, China) and an AH26 sealer (Dentsply Maillifer, Ballaigues, Switzerland) with the lateral compaction technique (Figure 7). Zonalin (Kemdent) was placed as a temporary coronal restoration, and the patient was referred to the restorative department for restorative treatment. The patient was advised to observe hygienic instructions and clean the germination area with an interproximal toothbrush.

At the 3-month follow-up visit, the periodontium was normal. In consultation with the restorative department, due to the impossibility of establishing isolation because of the gag reflex, there is no possibility to restore the tooth with composite materials, so the tooth was restored with amalgam (Figure 8). The patient was asymptomatic at the 6- and 12-month follow-ups (Figure 9).

3 | DISCUSSION

According to studies on the anatomy of the maxillary second molar tooth, in the mesiobuccal root, one canal was most prevalent (51.8%) and 47.8% of subjects had two canals; in the distobuccal root and palatal root, one canal was most prevalent (97.4% and 99.6%, respectively). The most common Vertucci types of canal configuration in the mesiobuccal root of the maxillary second molar were type I (56.1%), type II (16.9%), and type IV (12.2%).⁷

Peikoff et al. (1996) studied 520 endodontically treated maxillary second molars and reported six anatomic variations in this tooth:

- (i) Three separate roots and three separate root canals (in 56.9% of cases);
- (ii) Three separate roots and four root canals, two of which in the mesiobuccal root (in 22.7% of cases);
- (iii) Three roots and root canals, whose mesiobuccal and DB canals combine to form a common buccal with a separate palatal canal (in 9% of cases);
- (iv) Two separate roots with a single root canal in each (in 6.9% of cases);
- (v) One main root and canal (in 3.1% of cases); and
- (vi) Four separate roots and four separate root canals,

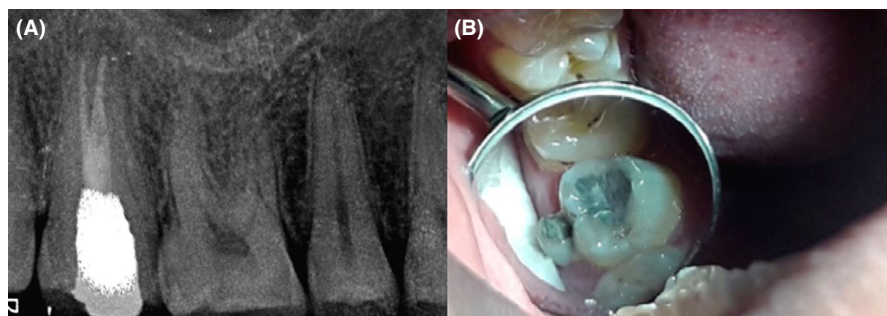
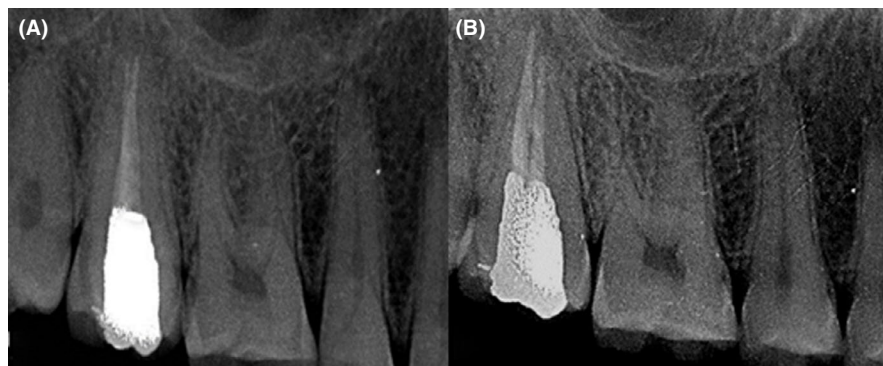


FIGURE 8 (A) Radiographs at the 3-month follow-up; (B) Intraoral photograph

FIGURE 9 (A) Radiographs at 6 months; (B) at 12 months



including two palatal (in 1.4% of cases).⁸

Thus, a maxillary second molar in gemination with four root canals constitutes a rare anatomic variation. Gemination and fusion are unusual anatomic developmental anomalies.⁹

Clinically, it might be difficult to make a distinction between fusion and gemination when a supernumerary tooth fuses to a permanent tooth. A diagnosis of gemination was reached based on the clinical view and CBCT examination.

The resulting structure might exhibit two completely or incompletely separate crowns with a single root or root canal in gemination. Its incidence in the deciduous dentition is 0.1–4% and is very rare in permanent dentition (0.05%).^{10,11}

Fusion is defined as an incomplete coalescence of two tooth buds. However, gemination is defined as the failed attempt of a tooth bud to divide into two. In the absence of a supernumerary tooth, a full complement of teeth indicates germination, while the absence of one tooth in the full complement of teeth indicates fusion. Radiographically, there is evidence of two distinct pulp chambers in fused teeth, while in gemination, there is only one pulp chamber.¹² Because of the special anatomy of the tooth, the groove between the buccal cusp, and the gemination portion, it seems that the bacteria and their products have been able to find a way to the tooth pulp. And as a result, pulp necrosis has occurred over time. This condition usually causes an early connection between the tooth pulp and the oral cavity, which requires endodontic treatment.

Due to superimposition, periapical radiographs cannot properly demonstrate the 3D anatomy of teeth. Besides, there might also be a geometric distortion of the anatomic structures evaluated.

In this case, the root canal morphology was confirmed by CBCT examination. Complex internal anatomy underscores the vital role of root canal morphology evaluations before undertaking endodontic treatment. CBCT examinations give rise to a better understanding of root canal anatomy so that clinicians can investigate the root canal systems more effectively and clean, shape, and obturate them more efficiently.¹³

Therefore, it seems that a proper understanding of tooth morphology in gemination/fusion cases using CBCT prevents or minimizes possible complications.¹⁴ CBCT also enables clinicians to detect changes in apical bone density at an earlier stage than conventional periapical radiographs and, therefore, has the potential to detect previously undiagnosed periradicular pathoses.¹⁵ As in this case, periapical 2D radiograph revealed no apical pathology, but in the CBCT sagittal view, we noticed a periapical lesion around the palatal root (Figure 4).

Identifying dental anomalies, such as germination, is critical before treatment planning for a tooth. Meticulous observations and appropriate investigations are indispensable to the clinical workout and diagnosis of different conditions. Even in teeth exhibiting complex root canal anatomies, non-surgical conventional endodontic treatment might lead to adequate healing and proper esthetic outcomes.

The CBCT radiographic technique confirmed the aberrant morphology of the root canal system in the geminated tooth presented here. This technique opens up new horizons for dental imaging for particular clinical cases. The posttreatment complications of such cases can be prevented, and clinical management can be facilitated by carefully reaching a pertinent and appropriate diagnosis.

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Published with written consent of the patient.

CONFLICTS OF INTERESTS

None.

AUTHOR CONTRIBUTION

MR carried out the clinical treatment and reviewed the manuscript. SA wrote the manuscript; MA reviewed the manuscript. All authors have read and approved the manuscript.

DATA AVAILABILITY STATEMENT

No data were obtained for this case report.

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